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CONTRIBUTION OF EXPORTS TO U.S. EMPLOYMENT

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Investment Analysis

March 1986

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STAFF REPORT

CONTRIBUTION OF EXPORTS TO U.S. EMPLOYMENT

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Project CTR-008-86

March 1986

Office of Trade and Investment Analysis
Trade Information and Analysis
International Trade Administration
U.S. Department of Commerce

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CONTRIBUTION OF EXPORTS TO U.S. EMPLOYMENT

Key Findings

- Full-time-equivalent jobs generated by U.S. goods exports peaked in 1980 at 7.2 million, then declined through 1984 by 25 percent to slightly below 5.5 million jobs. This includes both jobs directly and indirectly required to produce exports.

- Of the 1.8 million 1980-84 reduction in export-related jobs, decreased export volume cut 900,000 jobs, productivity growth 700,000, and increased use of imported raw materials, parts and components another 200,000.

- By 1984 the number of jobs generated by every billion dollars of U.S. goods exports had decreased to an average of 25,800 jobs.

- Decreased export-generated jobs accounted for 80 percent of the total U.S. decline in manufacturing jobs between 1980 and 1984.

- In 1984 one out of every six jobs in manufacturing was owed to exports.

- Goods exports in 1984 accounted for 800,000 jobs in high-tech industries, one-third of the total jobs in manufacturing generated by all exports.

- Manufactures exports generated 4.0 million jobs in all sectors in 1984, nearly three-fourths of the total from all exports.

- Four foreign markets accounted for over one-half of the total U.S. export-generated jobs in 1984:

-- EEC	1,172,000
-- Canada	1,004,000
-- Japan	615,000
-- Mexico	281,000

CONTRIBUTION OF EXPORTS TO U.S. EMPLOYMENT

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FOREWORD

The decline in U.S. trade performance has increased interest in the impact of trade on the U.S. economy. This report focuses on the total jobs generated by all U.S. goods exports between 1980 and 1984, with text analyses of:

-- Export jobs by sector -- manufacturing, agriculture, other goods and services.

-- High-tech and non-high tech export-related jobs.

-- Effects of export volume, productivity and imported inputs on export jobs.

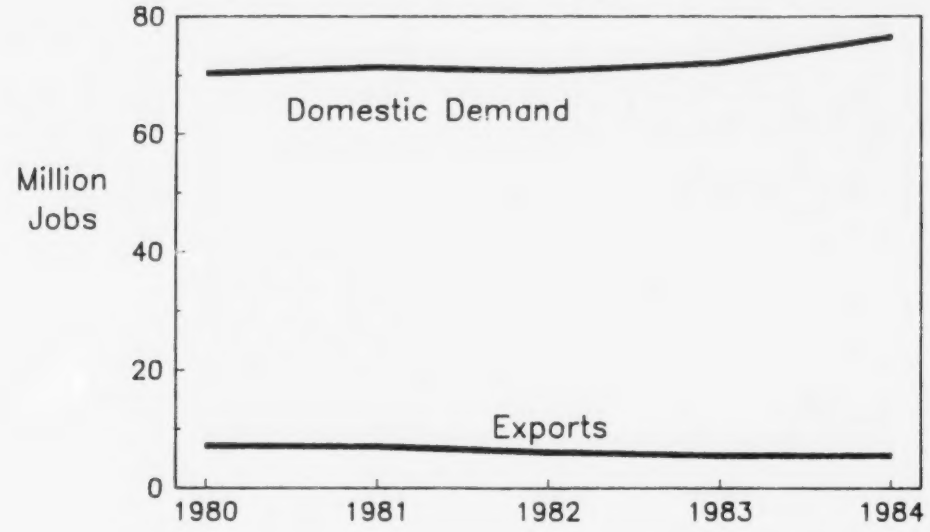
-- Jobs by export destination -- Canada, Mexico, Japan, and the European Economic Community.

Detailed supporting data tables are provided in the appendix.

TOTAL EXPORT-GENERATED JOBS

IN 1984, OF 81.9 MILLION U.S. CIVILIAN JOBS, 5.5 MILLION JOBS* WERE DIRECTLY AND INDIRECTLY GENERATED BY U.S. GOODS EXPORTS .

Fig. 1. U.S. EMPLOYMENT GENERATED BY EXPORTS AND DOMESTIC DEMAND, 1980-84
(In full-time equivalent jobs)



- Exports accounted for 6.7 percent of total civilian employment (including self-employed) in 1984 -- one out of every 15 jobs. Domestic demand accounted for 93.3 percent.
- In 1984 every billion dollars of exports generated an average of 25,800 jobs.

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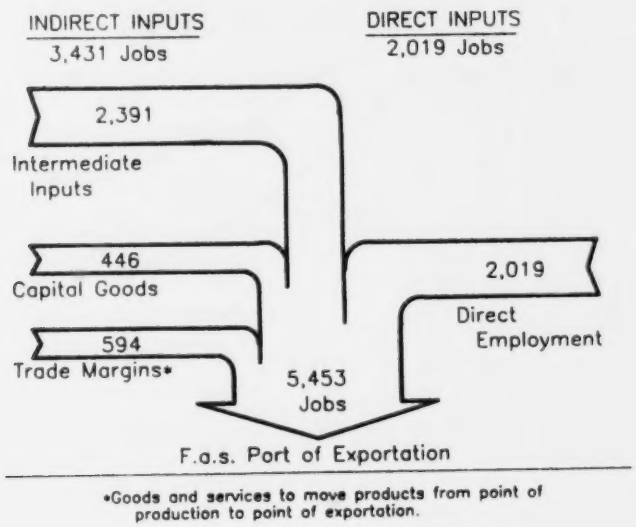
* This revises the preliminary estimate of over 4.5 million for 1984 issued by OTIA in mid-1984, and reflects an increase in the coverage to include capital goods used in producing exports, lower than expected productivity growth and lower use of imported inputs.

TOTAL EXPORT-GENERATED JOBS

FAR MORE JOBS ARE GENERATED BY GOODS EXPORTS THAN JUST THOSE DIRECTLY NEEDED IN THE PLANT OR OTHER FINAL POINT OF PRODUCTION WHERE EXPORTS ARE PUT IN FINISHED FORM. TOTAL EXPORT-RELATED EMPLOYMENT ALSO INCLUDES JOBS INDIRECTLY NEEDED TO PRODUCE EXPORTS.

Fig. 2. INPUT SOURCES OF JOBS GENERATED BY EXPORTS IN 1984
(Thousand full-time equivalent jobs)

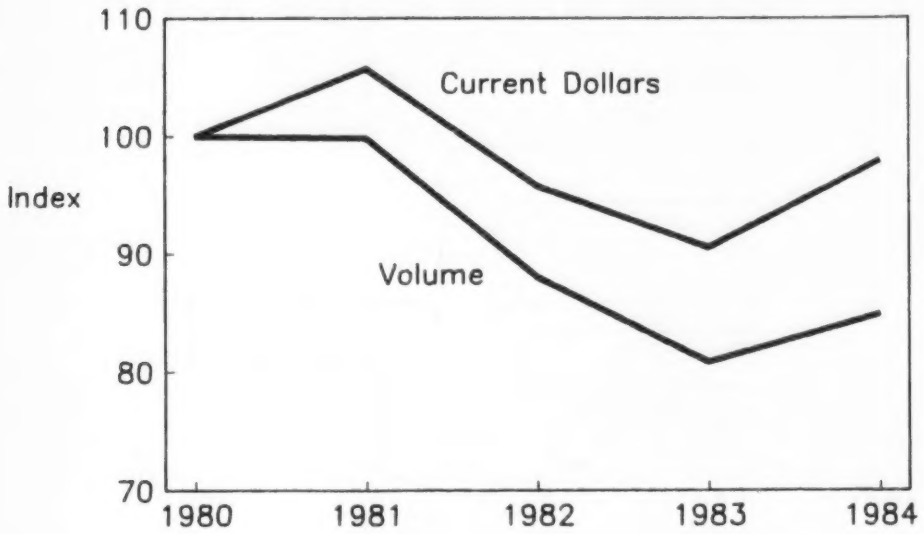


- o Indirectly generated employment includes workers producing:
  - -- Upstream in the production process
    - --Intermediate inputs of goods and services, and
    - --Capital goods inputs
  - -- Downstream "trade margins", the goods and services needed to move the finished product from final point of production to the port for export.
- o Nearly two jobs are indirectly generated for every direct job. In 1984 2.0 million jobs were directly generated by exports; 3.5 million were indirectly generated.
- o Upstream intermediate inputs accounted for the largest share of the jobs (44 percent), capital goods for 8 percent and trade margins 11 percent.

IMPORTANCE OF EXPORT-GENERATED JOBS TO THE U.S. ECONOMY

THE CONTRIBUTION OF EXPORTS TO U.S. OUTPUT HAS DECREASED SINCE 1980.

Fig. 3. U.S. EXPORTS IN CURRENT AND REAL (VOLUME) TERMS, 1980-84 (1980=100)

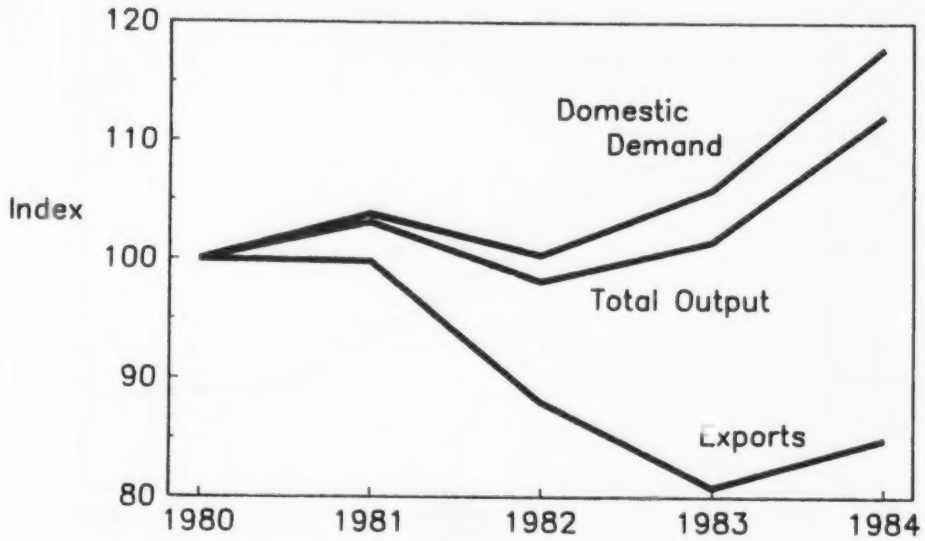


- o Export volume -- not dollar value -- determines the number of jobs exports generate.
  - -- Although the current dollar value of U.S. 1984 exports was only 1.3 percent below that in 1980, volume was 15 percent below its 1980 peak.

IMPORTANCE OF EXPORT-GENERATED JOBS TO THE U.S. ECONOMY

DURING 1980-84 U.S. OUTPUT OF GOODS FOR EXPORT DECLINED WHILE OUTPUT FOR DOMESTIC DEMAND ROSE.

Fig. 4. U.S. OUTPUT OF GOODS FOR EXPORTS AND DOMESTIC DEMAND, 1980-84
(1980=100)

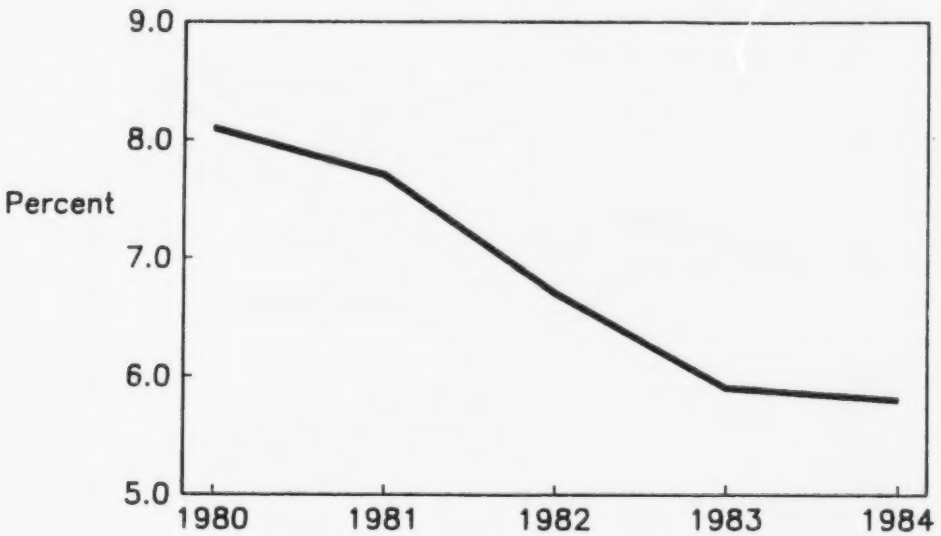


- Domestic demand grew rapidly in 1983 and 1984, to a level 19 percent higher in 1984 than 1980.
- The 15 percent 1980-84 export volume decrease pulled the growth rate for total U.S. output down 6 percentage points below the growth rate for domestic demand.

IMPORTANCE OF EXPORT-GENERATED JOBS TO THE U.S. ECONOMY

THE GOODS EXPORT SHARE OF U.S. GNP DROPPED DURING 1980-84, AS GOODS EXPORTS DECREASED WHILE GOODS OUTPUT FOR DOMESTIC DEMAND INCREASED.

Fig. 5. GOODS EXPORTS SHARE OF U.S. GNP, 1980-84
(In percent)

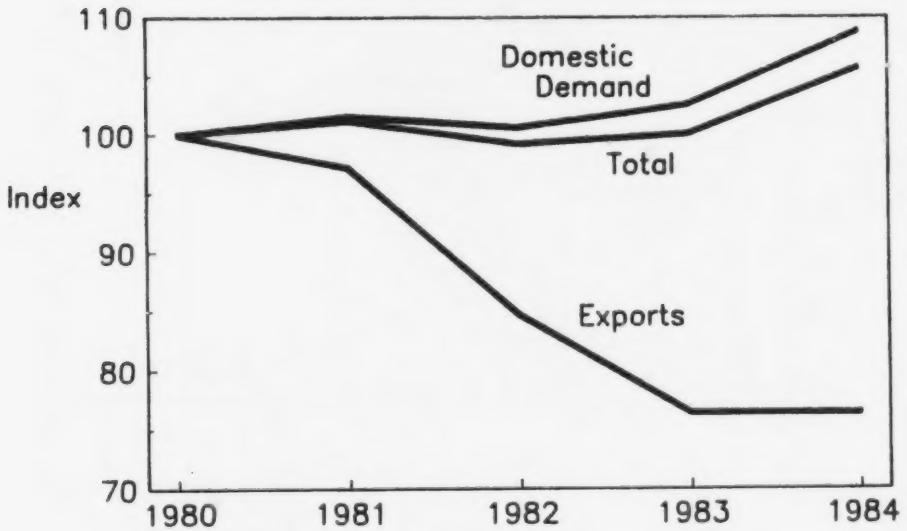


- The goods exports share of U.S. GNP dropped from 8.1 in 1980 to 5.8 percent in 1984.

IMPORTANCE OF EXPORT-GENERATED JOBS TO THE U.S. ECONOMY

EMPLOYMENT GENERATED BY EXPORTS FELL DURING 1980-84 WHILE EMPLOYMENT GENERATED BY OUTPUT FOR DOMESTIC DEMAND INCREASED.

Fig. 6. U.S. EMPLOYMENT GENERATED BY EXPORTS AND DOMESTIC DEMAND, 1980-84
(1980=100)

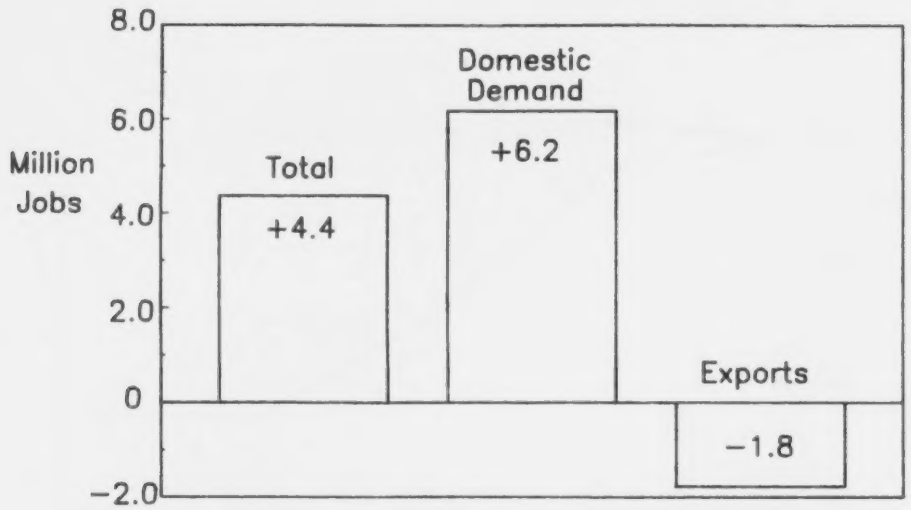


- Between 1980 and 1984 export-generated employment dropped by 1.8 million jobs, a 25 percent decrease.
- During the same period employment generated by domestic demand dipped slightly in 1982 and 1983, but by 1984 was 7 percent over its 1981 peak.
- The 25 percent drop in export-generated employment was greater than the 15 percent drop in export volume, mainly because of rising productivity (output per worker).

IMPORTANCE OF EXPORT-GENERATED JOBS TO THE U.S. ECONOMY

THE 25 PERCENT 1980-84 EXPORT EMPLOYMENT DROP PARTLY OFFSET GAINS IN EMPLOYMENT GENERATED BY OUTPUT FOR DOMESTIC DEMAND.

Fig.7. CHANGES IN U.S. EMPLOYMENT GENERATED BY EXPORTS AND DOMESTIC DEMAND, 1980-84
(In full-time equivalent jobs)

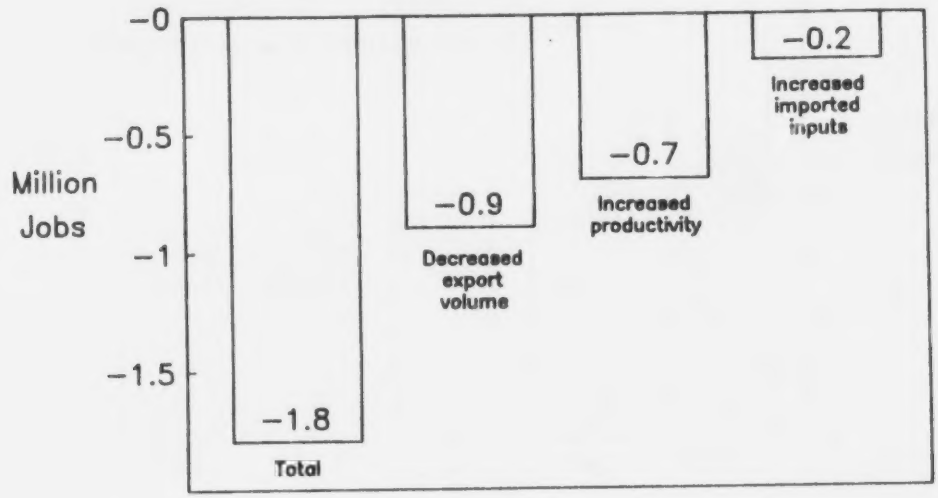


- The 25 percent 1980-84 decrease in export jobs offset nearly one-third of the 7 percent increase in jobs generated by domestic demand.

SOURCES OF EMPLOYMENT CHANGE

JOBS OWED TO EXPORTS BETWEEN 1980 AND 1984 WERE REDUCED BY DECREASED EXPORT VOLUME, INCREASED PRODUCTIVITY AND INCREASED USE OF IMPORTED INPUTS.

Fig. 8. NUMBER OF EXPORT-GENERATED JOBS REDUCED BY MAJOR FACTORS, 1980-84
(In full-time equivalent jobs)



- Export-job reductions by principal factors:

-- Decreased export volume	-900,000
-- Increased productivity (output per job)	-700,000
-- Increased use of imported inputs	-200,000

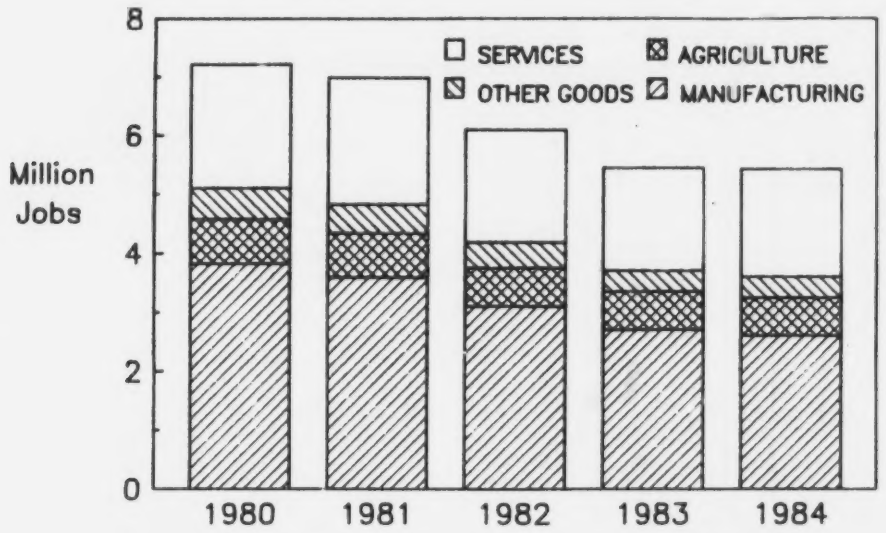
- Change in product composition does not appear to have had a significant effect.

- Number of jobs generated by each billion dollars of exports (in terms of 1984 prices) declined from 29,000 in 1980 to 25,800 in 1984, mainly due to productivity growth and -- to a lesser extent -- increased use of imported inputs.

LOCATION OF EXPORT-GENERATED JOBS

MANUFACTURING ACCOUNTS FOR THE LARGEST SHARE OF JOBS GENERATED BY ALL GOODS EXPORTS.

Fig. 9. EXPORT-GENERATED JOBS, BY EMPLOYING SECTORS, 1980-84
(In full-time equivalent jobs)



- o 1984 shares of export-related jobs:

-- Manufacturing	49 %
-- Services	36 %
-- Agriculture	12 %
-- Other Goods	4 %

- o Export-generated jobs were most important in the manufacturing sector.

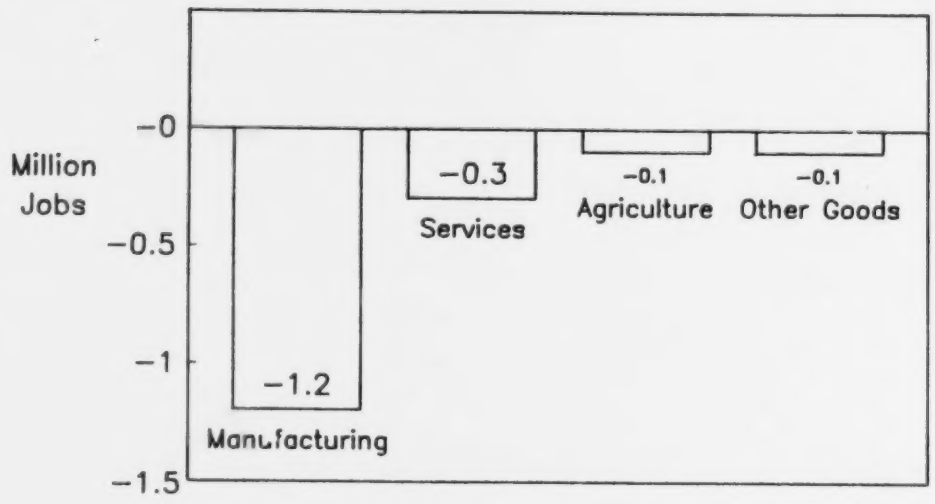
	Export-related Share of All Jobs in Sector
-- Manufacturing	16 %
-- Agriculture	13 %
-- Other Goods	13 %
-- Services	3 %

- o Services account for two-thirds of total U.S. employment, but only for one-third of total export-related employment.

LOCATION OF EXPORT-GENERATED JOBS

MANUFACTURING JOBS WERE HIT HARDEST BY THE 1980-84 DECREASE IN EXPORT-GENERATED EMPLOYMENT.

Fig. 10. DECREASE IN EXPORT-GENERATED JOBS, BY EMPLOYING SECTOR, 1980-84
(In full-time equivalent jobs)



- Of the total 1.8 million decrease in export-generated jobs, cuts in individual sectors were:

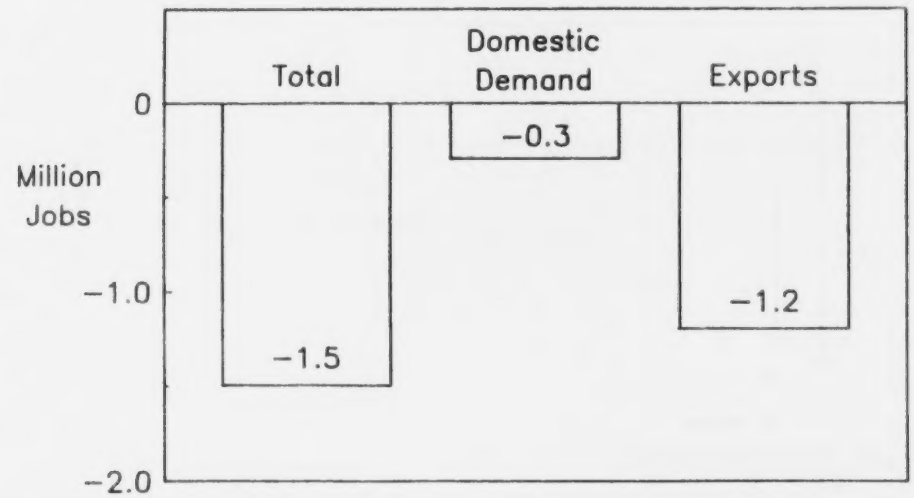
-- Manufacturing	-1,225,000	-32 %
-- Services	-337,000	-15 %
-- Agriculture	-109,000	-15 %
-- Other goods	-114,000	-33 %

- The 337,000 services jobs lost because of decreased goods exports illustrates the important indirect impact of exports on the economy.

EXPORT JOBS IN MANUFACTURING

EXPORT DECLINES WERE RESPONSIBLE FOR THE MAJOR PART OF THE TOTAL 1980-84 DECREASE IN U.S. MANUFACTURING EMPLOYMENT.

Fig. 11. DECREASE IN MANUFACTURING INDUSTRIES' JOBS GENERATED BY EXPORTS AND DOMESTIC DEMAND, 1980-84
(In full-time-equivalent jobs)

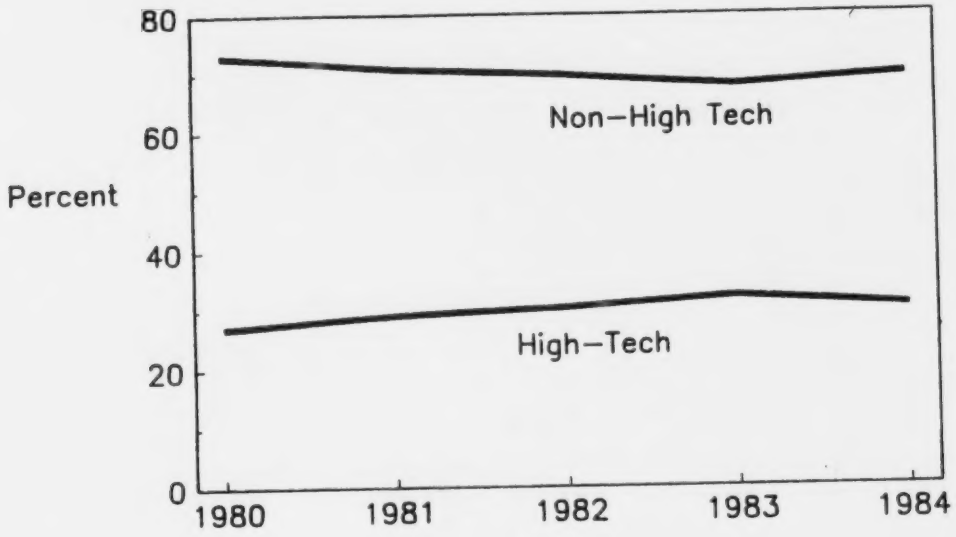


- Export job decreases accounted for 80 percent of the total 1980-84 decrease in U.S. manufacturing jobs.
- Export-related manufacturing jobs in 1984 were down 32 percent from 1980, a reduction of 1.2 million jobs, while jobs generated by domestic demand in 1984 had virtually recovered to their 1980 peak.

EXPORT JOBS IN MANUFACTURING

HIGH-TECH INDUSTRIES' SHARE OF ALL EXPORT JOBS IN MANUFACTURING EDGED UPWARD DURING 1980-84.

Fig. 12. HIGH-TECH AND NON-HIGH TECH INDUSTRIES' SHARES OF EXPORT-GENERATED JOBS IN MANUFACTURING, 1980-84
(In percent of full-time equivalent jobs)

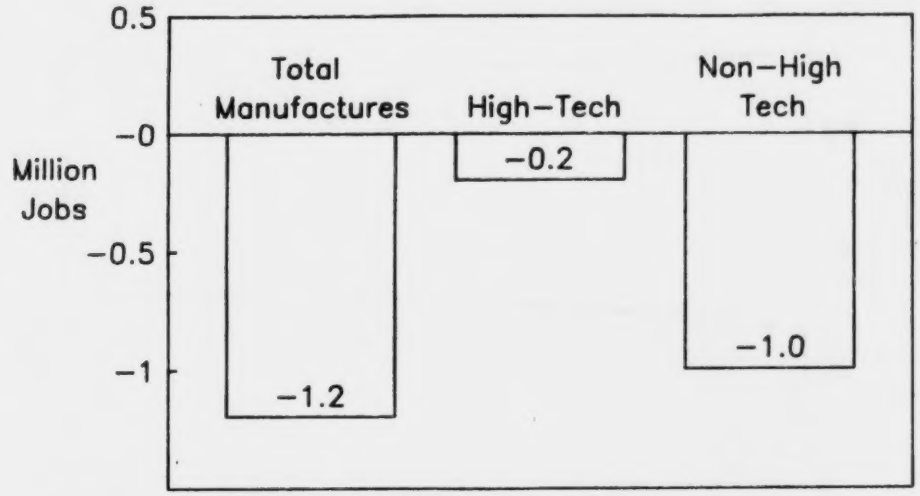


- The high-tech share of manufacturing jobs generated by total U.S. exports increased slightly from 27 percent in 1980 to 32 percent in 1983 and 30 percent in 1984.

EXPORT JOBS IN MANUFACTURING

HIGH-TECH DECREASED LESS THAN NON-HIGH TECH EXPORT-GENERATED MANUFACTURING JOBS DURING 1980-84.

Fig. 13. DECREASE IN HIGH-TECH AND NON-HIGH TECH MANUFACTURING INDUSTRIES JOBS GENERATED BY EXPORTS, 1980-84
(In full-time equivalent jobs)

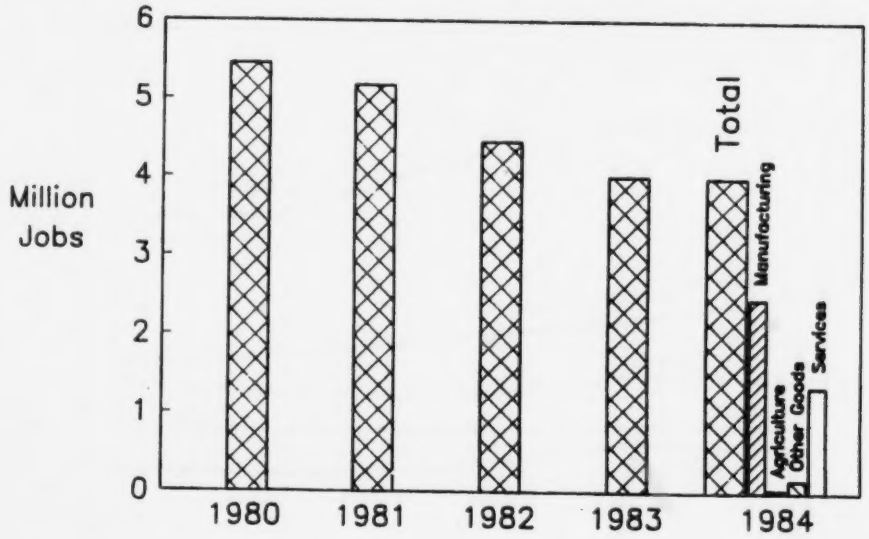


- Export-related jobs in high-tech industries decreased much less than those in non-high tech industries between 1980 and 1984.
  - -- High-tech jobs decreased by over 200,000 to 800,000, down 23 percent.
  - -- Non-high tech manufacturing jobs decreased by nearly 1.0 million to 1.8 million, down 35 percent.

JOBS GENERATED BY MANUFACTURES EXPORTS

IN 1984 MANUFACTURES EXPORTS GENERATED 4.0 MILLION JOBS IN ALL SECTORS:

Fig. 14. JOBS GENERATED BY MANUFACTURES EXPORTS, BY EMPLOYING SECTOR, 1980-84
(In full-time equivalent jobs)



- Jobs generated in all sectors by manufactures exports dropped by 26 percent during 1980-84 from 5.4 to 4.0 million.

- Manufactures exports accounted for most of the jobs generated by total exports in each sector in 1984, except for agriculture.

-- Manufacturing	2,470,000
-- Services	1,441,000
-- Agriculture	26,000
-- Other Goods	93,000

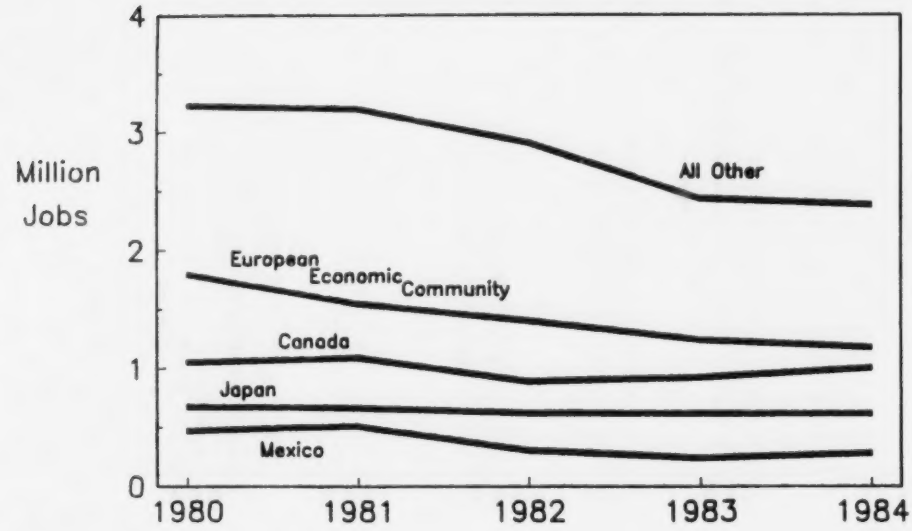
- Services' share of manufactures exports jobs rose from 29 to 34 percent during 1980-84, mainly reflecting higher manufacturing than services productivity growth rates.

- In raw materials and energy industries more jobs were generated indirectly by manufactures exports than directly by those industries' own exports.

EXPORT JOBS BY INDIVIDUAL FOREIGN MARKETS

FOUR EXPORT MARKETS ACCOUNT FOR OVER ONE-HALF OF TOTAL U.S. EMPLOYMENT GENERATED BY EXPORTS.

Fig. 15. U.S JOBS GENERATED BY EXPORTS TO MAJOR FOREIGN MARKETS, 1980-84
(In full-time equivalent jobs)



- o 1984 exports jobs by foreign market:

-- European Economic Community	1,172,000
-- Canada	1,004,000
-- Japan	615,000
-- Mexico	281,000
-- Other markets	2,381,000

- o Jobs in exports to Canada and Japan have not dropped sharply since 1980.
- o The European Economic Community accounted for one-third of the 1980-84 decrease in total jobs generated by exports.
- o Jobs in exports to Japan have edged downward since 1980 mainly due to U.S. productivity growth.
- o Mexico accounted for 10 percent of the 1980-84 drop in export jobs. The Mexican job drop (-40 percent) mainly reflects import cut-backs to meet foreign debt obligations.

MAIN EMPLOYING INDUSTRIES

EMPLOYMENT IN TEN INDUSTRIES ACCOUNTED FOR 20 PERCENT OF TOTAL EXPORT-RELATED JOBS IN 1984.

Top Ten Export-Related Employing Industries in 1984

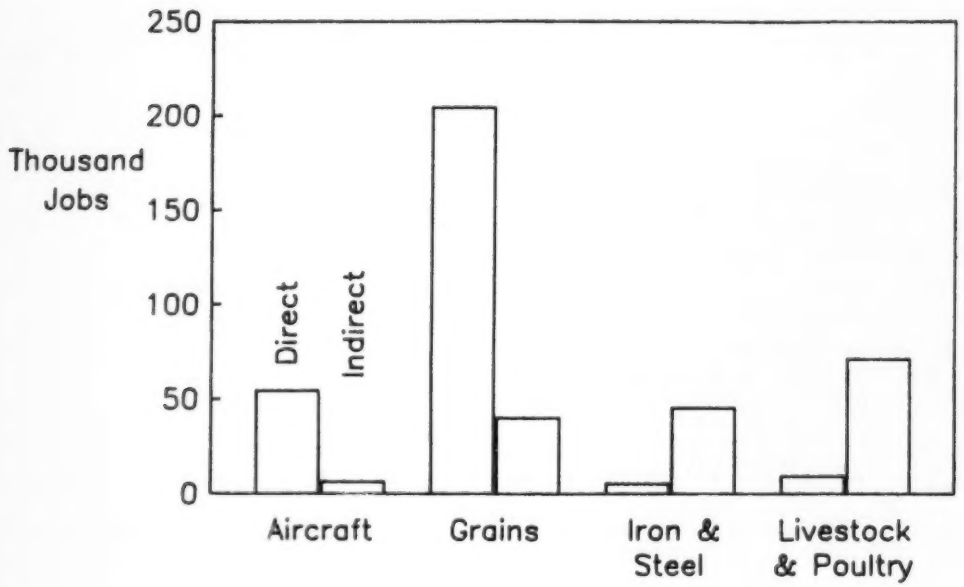
Industry	Thousands of jobs		
	Total of Direct & Indirect	Total Direct only	Per $bill. Direct Exports
Grains (ex. soybeans).....	256	205	13.9
Electronic computing equip....	149	107	8.3
Electronic components.....	147	71	8.8
Oil bearing crops (incl. soybeans.....	143	109	14.3
Industrial chemicals.....	100	44	4.3
Livestock and poultry.....	82	10	15.6
Aircraft parts (ex. engines)..	72	55	9.6
Printing and publishing.....	63	16	11.6
Aircraft.....	59	52	8.9
Other motor vehicle equip. & parts.....	58	33	3.6

- Grains continued to lead in 1984 as an employer in export-generated jobs, but high-tech industries accounted for a large share of the top ten.

MAIN EMPLOYING INDUSTRIES

DIRECT VERSUS INDIRECT SHARES, AND DIRECT EXPORT-LABOR INTENSITIES VARY WIDELY BETWEEN INDUSTRIES

Fig. 16. JOBS GENERATED DIRECTLY AND INDIRECTLY BY TOTAL EXPORTS IN SELECTED INDUSTRIES IN 1984
(In full-time equivalent jobs)



- Shares of total industry export-related employment in 1984:

	Direct	Indirect
Aircraft	88 %	12 %
Grains (ex. soybeans)	80 %	20 %
Primary iron & steel	12 %	88 %
Livestock & poultry	12 %	88 %

- Direct labor intensity:

	Direct jobs per $Billion Exports
Motor vehicles and parts	3,600
Industrial chemicals	4,300
Electronic computing equip.	8,300
Livestock & poultry	15,600

APPENDIX A

LIST OF DETAILED TABLES

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APPENDIX A

STATISTICAL TABLES

Table 1.

EXPORT-RELATED EMPLOYMENT
BY EXPORTING AND EMPLOYING SECTORS, 1980-84
(Thousand full-time equivalent jobs)

Exporting Sector	Employing Sectors: All Sectors	Manufacturing*	Agriculture	Other Goods	Services
All Goods Sectors:					
1980....	7,238	3,851	748	349	2,290
1981....	7,010	3,612	749	335	2,315
1982....	6,121	3,121	651	307	2,042
1983....	5,473	2,728	645	239	1,861
1984....	5,453	2,626	639	235	1,953
Manufactures*:					
1980....	5,431	3,589	35	137	1,670
1981....	5,160	3,347	31	128	1,655
1982....	4,472	2,894	26	106	1,446
1983....	4,008	2,549	26	88	1,345
1984....	4,028	2,470	26	93	1,441
Agriculture:					
1980....	1,360	176	710	27	446
1981....	1,408	177	716	31	484
1982....	1,213	145	622	27	418
1983....	1,134	122	617	21	374
1984....	1,120	108	611	22	379
Other Goods:					
1980....	447	86	3	185	173
1981....	443	88	3	176	176
1982....	437	82	3	174	178
1983....	331	56	3	130	141
1984....	304	48	2	121	134

* SITC 5-9.

Table 2

EXPORT-RELATED EMPLOYMENT, BY EXPORTING SECTOR,
BY TYPE OF EMPLOYMENT DEMAND SOURCE IN 1984
(Thousand full-time equivalent jobs)

Type of Employment Demand Source	Exporting Sectors: All Sectors	Manufactures**	Agriculture	Other Goods
Total.....	5,453	4,028	1,120	304
Direct output for export.....	2,019	1,512	431	76
Indirect demand (including indirect from own industry), total*....	3,434	2,516	689	228
Upstream:				
Intermediate inputs..	2,391	1,802	459	131
Capital goods.....	446	312	90	44
Downstream:				
Trade margins.....	596	403	139	53

* Demand by each type of indirect source includes all goods and services of export-related employment directly and indirectly required by that source, regardless whether from that source sector or others.
Totals may not add due to rounding.
** SITC 5-9.

Table 3

U.S. DEPENDENCE ON EXPORT-RELATED EMPLOYMENT, BY EMPLOYING SECTOR, 1980-84
(In full-time equivalent jobs)

Employing Sector	Thousands of Jobs			Export-related Share of Total (Percent)
	Total Civilian	Non-export related	Export-related	
All Sectors:				
1980....	77,531	70,293	7,238	9.3
1981....	78,430	71,420	7,010	8.9
1982....	76,851	70,730	6,121	8.0
1983....	77,552	72,079	5,473	7.1
1984....	81,918	76,465	5,453	6.7
Manufactures*:				
1980....	17,710	13,859	3,851	21.7
1981....	17,677	14,065	3,612	20.0
1982....	16,295	13,174	3,121	19.2
1983....	15,992	13,264	2,728	17.1
1984....	16,190	13,564	2,626	16.2
Agriculture:				
1980....	4,793	4,045	748	15.6
1981....	4,711	3,962	749	15.9
1982....	4,743	4,092	651	13.7
1983....	4,572	3,927	645	14.1
1984....	4,783	4,144	639	13.4
Other goods:				
1980....	1,869	1,520	349	18.7
1981....	1,942	1,607	335	17.3
1982....	1,855	1,548	307	16.5
1983....	1,683	1,444	239	14.2
1984....	1,763	1,528	235	13.3
Services:				
1980....	53,160	50,870	2,290	4.3
1981....	54,101	51,786	2,315	4.3
1982....	53,958	51,916	2,042	3.8
1983....	55,305	53,444	1,861	3.4
1984....	59,182	57,229	1,953	3.3

* SITC 5-9.

Table 4

U.S. EMPLOYMENT REQUIRED PER BILLION 1984 DOLLARS OF U.S. EXPORTS, BY EXPORTING SECTOR, 1980-84*
(In full-time equivalent jobs)

	Exporting Sector			
	All Sectors	Manufactures**	Agriculture	Other Goods
1980.....	29,000	29.200	30,800	23,000
1981.....	28,200	28,500	29,000	22,700
1982.....	27,900	28,500	29,300	20,700
1983.....	27,200	27,300	30,200	19,258
1984.....	25,800	25,600	29,100	18,914

* Including jobs in services. Based on exports valued f.a.s. port of exportation.
** SITC 5-9.

Table 5

EXPORT-RELATED EMPLOYMENT IN HIGH-TECH AND NON-HIGH TECH MANUFACTURING INDUSTRIES, 1980-84*
(Thousand full-time equivalent jobs)

	Export-Related Manufacturing Jobs			High-Tech Share (Percent)
	Total	High-Tech	Non-High Tech	
1980.....	3,851	1,038	2,813	27.0
1981.....	3,612	1,054	2,558	29.2
1982.....	3,121	950	2,171	30.4
1983.....	2,728	876	1,852	32.1
1984.....	2,626	799	1,827	30.4

* Manufacturing output in terms of SITC 5-9.

Table 6

EXPORT DEPENDENCE ON IMPORTED INPUTS,
BY EXPORTING SECTOR, 1980-84
(Values in billion 1984 dollars)

Exporting Sector	Real Export-related Inputs (In billion 1984 dollars)			Import Dependence Ratio (In Percent)
	Total (Exports)	Domestic	Imported	
All Goods Sectors:				
1980.....	249.4	225.7	23.7	9.5
1981.....	248.8	222.7	26.1	10.5
1982.....	219.5	195.0	24.5	11.2
1983.....	201.4	177.7	23.7	11.8
1984.....	211.7	184.6	27.1	12.8
Manufactures*:				
1980.....	185.8	168.8	17.0	9.1
1981.....	180.8	162.1	18.7	10.3
1982.....	157.0	139.7	17.3	11.0
1983.....	146.7	130.7	16.9	11.5
1984.....	157.1	136.6	20.5	13.0
Agriculture:				
1980.....	44.2	40.1	4.1	9.3
1981.....	48.5	44.0	4.5	9.3
1982.....	41.5	37.8	3.7	8.9
1983.....	37.6	33.9	3.7	9.8
1984.....	38.5	34.6	3.9	10.2
Other goods:				
1980.....	19.4	16.8	2.6	13.4
1981.....	19.6	16.7	2.9	14.8
1982.....	21.1	17.7	3.4	16.1
1983.....	17.2	14.1	3.1	18.0
1984.....	16.1	13.4	2.7	16.8

* SITC 5-9.

Table 7.

EXPORT-RELATED EMPLOYMENT, BY FOREIGN MARKET,
BY EXPORTING SECTOR, 1980-84
(Thousand full-time equivalent jobs)

Exporting Sector	Foreign Market					
	Total	Canada	Mexico	Japan	EC-10	Other
All Goods Sectors:						
1980....	7,238	1,056	474	679	1,799	3,230
1981....	7,010	1,088	514	666	1,544	3,198
1982....	6,121	887	305	621	1,398	2,910
1983....	5,473	920	238	614	1,235	2,466
1984....	5,453	1,004	281	615	1,172	2,381
Manufactures*:						
1980....	5,431	929	380	333	1,353	2,436
1981....	5,160	961	424	318	1,124	2,333
1982....	4,472	772	247	308	1,000	2,145
1983....	4,008	810	169	320	916	1,793
1984....	4,028	896	211	328	901	1,692
Agriculture:						
1980....	1,360	62	79	204	313	702
1981....	1,408	63	77	220	286	762
1982....	1,213	57	39	186	272	659
1983....	1,134	58	59	201	233	583
1984....	1,120	56	61	206	193	604
Other goods:						
1980....	447	66	14	142	133	92
1981....	443	64	14	127	134	104
1982....	437	57	19	127	126	108
1983....	331	53	9	92	87	90
1984....	304	52	11	82	78	81

* SITC 5-9.

Table 8

TOTAL EXPORT-RELATED EMPLOYMENT,
BY INDIVIDUAL EMPLOYING INDUSTRY, 1980-84
(Thousand full-time equivalent jobs)

Employing Industry	1980	1981	1982	1983	1984
Total, all industries.....	7,238	7,010	6,121	5,473	5,453
Agriculture, total.....	748	749	651	645	639
Grains & products.....	309	337	266	269	270
Soybeans & other oil bearing crops.....	175	158	159	156	143
Cotton.....	47	41	34	30	37
Tobacco & products.....	41	38	37	35	33
Livestock, poultry & prod..	95	95	87	92	94
Fats & oils.....	26	24	22	19	17
Other non-manufactured goods, total.....	349	335	307	239	235
Forestry products.....	104	85	77	69	64
Coal.....	69	75	70	44	41
Crude & refined petroleum..	80	68	71	53	57
Natural gas.....	22	27	25	19	21
Chemical & fertilizer minerals.....	16	13	11	10	7
Pulp mill products.....	15	14	12	11	11
Manufactures, total*.....	3,851	3,612	3,121	2,728	2,626
Textile mill products.....	86	75	56	45	43
Apparel & accessories.....	60	55	38	33	29
Millwork & other advanced wood products.....	19	20	15	14	13
Furniture & fixtures.....	24	25	21	20	24
Paper mill products.....	17	17	14	12	12
Paperboard.....	21	18	16	15	14
Other paper products.....	35	34	30	27	26
Printing & publishing.....	81	79	69	64	63
Industrial organic & inorganic chemicals.....	136	131	123	108	100
Plastics, synthetic resins non-vulcanized elastomers	32	33	32	28	24
Manmade fibers.....	15	15	11	8	8
Drugs & medicines.....	15	15	15	14	12
Agri. chemical fertilizers.	26	25	23	18	23
Tires & inner tubes.....	20	18	13	11	11
Glass & products.....	23	22	19	16	15
Primary iron & steel.....	118	100	92	68	52
Primary aluminum.....	24	18	16	14	12
Other primary non-ferrous metals.....	63	42	24	23	23

Table 8 (continued)

TOTAL EXPORT-RELATED EMPLOYMENT,
BY INDIVIDUAL EMPLOYING INDUSTRY, 1980-84
(Thousand full-time equivalent jobs)

Employing Industry	1980	1981	1982	1983	1984
Manufactures (continued):					
Rolled & drawn aluminum....	17	17	15	12	12
Boilers, nuclear reactors, & other metal plate work	21	21	18	14	12
Motor vehicle stampings...	25	24	22	23	25
Metal valves, & tube & pipe fittings.....	30	29	25	20	17
Turbines & turbine generators.....	13	11	12	10	7
IC engines, ex. non diesel motor veh. & aircraft...	42	43	38	28	25
Farm machinery, equip.....	46	39	30	26	21
Construction machinery....	114	112	82	52	44
Oil & gas field machinery.	53	58	68	40	29
Machine tools, dies & accessories.....	83	81	67	60	55
Printing machinery.....	11	12	9	7	5
Pumps & compressors.....	43	43	40	32	26
Electronic computing equip	146	151	140	146	149
Other office & accounting machinery.....	15	14	11	9	7
Refrigeration & heating equip.....	27	27	22	18	17
Electrical distribution & transmission equip.....	24	23	21	18	16
Household appliances.....	17	17	13	10	8
Electric lighting equip...	11	10	8	7	6
Electric wiring devices...	18	18	15	13	14
Radio, TV, phonographs & other audio equip.....	15	13	8	6	4
Telephone & telegraph apparatus.....	19	20	19	16	13
Radio TV broadcast & other communication equip.....	70	71	61	58	46
Solid state semi-conducting devices.....	64	69	71	75	70
Other electronic components & accessories.....	95	102	93	89	77
X-ray & other electrical therapy apparatus.....	15	16	16	14	13
IC engine electric equip..	13	12	10	10	11
Motor vehicles & auto bodies.....	57	60	43	41	40
Other motor vehicle equip.	84	88	71	58	58

Table 8 (continued)

TOTAL EXPORT-RELATED EMPLOYMENT,
BY INDIVIDUAL EMPLOYING INDUSTRY, 1980-84
(Thousand full-time equivalent jobs)

Employing Industry	1980	1981	1982	1983	1984
Aircraft	121	127	82	75	59
Aircraft & missile engines	43	45	43	39	39
Other aircraft & missile parts	76	78	71	67	72
Ships & boats	18	20	23	14	7
Railroad equip	21	24	18	15	16
Military tanks & parts	11	17	24	19	17
Electrical measuring instruments	31	32	31	30	30
Other instruments for measuring, controlling & testing	59	58	51	45	39
Optical instruments	18	17	15	16	14
Medical instruments & supplies	18	19	18	17	15
Photographic equip & supplies	51	48	44	40	37
Jewelry	16	12	9	9	8
Services, total	2,290	2,315	2,042	1,861	1,953
Transportation	302	311	294	265	258
Trade	1,008	1,041	894	784	815
Communications	62	61	54	49	54
Utilities	57	56	51	48	54
Financial	95	99	87	82	88
Construction (maintenance & repair)	178	153	124	114	125

* Individual industries do not add to sector sub-totals due to absence from listing of "all other" classes.
**SITC 5-9.

APPENDIX B

METHODOLOGY*

The Office of Trade and Investment Analysis published in May 1983 estimates of export-related employment for 1980 and 1982 and in 1984 released a preliminary estimate of the total for 1984. This report is based on a new, detailed analysis for each of the years 1980-84. This new analysis resulted in an increase in the total estimated for 1984 from 4.5 million to 5.5 million jobs. One cause of the increased 1984 estimate is the first-time inclusion of jobs indirectly generated by capital goods used to produce exports. Also new are separate estimates for export jobs generated in high-tech versus non-high tech manufacturing industries and by exports to individual major foreign markets, and for impacts of increased productivity and increased use of imported inputs.

This paper is based on total domestic input-output requirements coefficients for goods and services inputs for U.S. domestic merchandise exports for each of the years described. Changes in these total coefficients reflect changes in technology and productivity between those years. These total domestic coefficients also reflect deduction from direct requirements of inputs supplied by imported merchandise before reestimation of total domestic requirements coefficients. Estimates of total domestic export-related employment requirements are the sum of employment required to domestically produce goods and services directly required and indirectly required as intermediate inputs, capital goods and trade margins. (Trade margins are the goods and services required to move the goods to be exported from their point of final production to the port of exportation.)

The calculations used the 480 sector INFORUM input-output model of the U.S. economy and associated data bases developed and maintained by the Interindustry Economic Research Fund at the University of Maryland. The model's technical coefficients are based on the BEA (Bureau of Economic Analysis, U.S. Department of Commerce) 1977 benchmark input-output tables, updated with as much existing data as possible and projected to 1984.

The calculations embody five key criteria: (1) domestic direct requirements matrixes estimated by deducting from total direct requirements the share of inputs supplied by imports; (2) separate requirements coefficients matrixes for each year to reflect changes in technology and productivity, rather than the same matrix for more than one year which implies no technology change; (3) output

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* The input-output computations in this report were produced by Dr. Douglas E. Nyhus, of the Interindustry Economic Research Fund, University of Maryland, using the INFORUM input-output models and data bases, and using specially prepared export data supplied by the author from data collected by the U.S. Bureau of the Census.

requirements in a year estimated from requirements coefficients matrixes and therefore technology and productivity for that same year rather than a prior year; (4) inclusion of direct and indirect capital goods requirements; and (5) inclusion of direct and indirect trade margin requirements.

The four main calculation steps are: (1) estimating the domestic content of the direct requirements coefficients matrix and its corresponding domestic total requirements coefficients matrix; (2) computing the total domestic input requirements to produce exports by multiplying the domestic total requirements coefficients matrix by a vector of export values; (3) computing the indirect domestic output requirements by multiplying the domestic direct requirements by the export vector and then subtracting the result from (2); and (4) computing total and indirect domestic employment requirements by multiplying (2) and (3) by employment-output ratios.

Steps (2) and (3) were computed separately for: (a) exports valued f.o.b. point of production, as the input-output requirements coefficients are calculated on an f.o.b. basis, (b) capital goods required in the year for which employment is being estimated, and (c) trade margins. Results of (a), (b), and (c) were then added to produce the total employment requirements for exports on a f.a.s. port of exportation basis.

The export data used are only for domestic exports and do not include reexports of foreign merchandise. The separate estimates for exports to Canada, Mexico, Japan and the European Economic Community (EC-10) were computed as above using the separate commodity detailed export data for those destinations. As these estimates are in terms of output and employment required to produce exports, they do not explicitly include jobs generated by expenditure of income earned from that output and jobs.

The following definitional-computational equation was used to estimate "TR", the vextor of total (direct and indirect) domestic output of goods and services required to produce exports, their capital requirements, and their trade margins.

$$TR = (I-(\hat{1-m/s})A)^{-1} \cdot e$$

For which the direct output required is "e", and the indirect output required is:

$$(I-(\hat{1-m/s})A)^{-1} \cdot e - e$$

Where:

I is a diagonal matrix of "ones",

$(1\hat{-}m/s)$ which equals $d\hat{/}s$, is the diagonal matrix formed by domestic shares of outputs delivered to interindustry and to final demands, for which:

- m is imports,
- d is net domestic shipments (total shipments minus exports). and,
- s is total supply of outputs (domestic shipments plus imports, less exports) available to interindustry and final demands except exports,

A is the direct requirements coefficients matrix,

$(1\hat{-}m/s)A$ is the domestic direct requirements matrix,

$(I-(1\hat{-}m/s)A)^{-1}$ is the total domestic requirements coefficients matrix, and

e is exports.

$\hat{}$ indicates that vector underneath this symbol has been transformed into a diagonal matrix.

Capital goods employment requirements of exports in each year are based on the shares of each industry's total capital goods purchases in that year that are directly or indirectly export-related, plus the indirect inputs required by those capital goods.

Export-related employment in this report is in terms of full-time equivalent (FTE) civilian jobs, including self-employed workers. FTE jobs are used instead of number of workers employed in order to avoid the variability between industries and over time in the share of total employment of part-time versus full-time workers and also the variability in over-time worked. For 1984, the total 105.0 million civilian workers employed (based on the BLS household survey), after adjustment for over-time and part time, equates to 81.9 million FTE jobs.

The number of export-related FTE jobs is calculated by multiplying the export-related output of each industry by the appropriate ratio for the FTE jobs per unit of output for that industry for the year being estimated. At the time this report was prepared data on FTE jobs had been reported by the Bureau of Economic Analysis, U.S. Department of Commerce, only through 1983. The ratios for 1984 were estimated by projecting the 1983 FTE-based ratios by the change in the total number of hours worked and the number of workers (full and part-time) reported by the U.S. Bureau of Labor Statistics for 1983 and 1984.

The extent productivity growth reduced export-related employment between 1980 and a later year was estimated as the difference between the sum of each industry's export-related output multiplied by its employment/output ratio for (1) 1980 and (2) that later year.

Goods termed "manufactures" in this report are those in SITC (Standard International Trade Classification) classes 5-9, and thus exclude some goods classed as manufactures in the SIC (Standard Industrial Classification of the United States) classes 19-39, such as refined petroleum products and processed foods. The narrower SITC coverage is more generally used in international trade analysis.

The classification of U.S. output and employment according to high-tech and non-high tech industries is that designated as the "DOC-3" definition in U.S. Department of Commerce analytical reports on U.S. foreign trade. The product coverage under this definition was estimated by the Office of Trade and Investment Analysis on the basis of total direct and indirect technology intensity of individual industries. For a reference providing more information on high-tech classification methods, see in Appendix B: Davis..., Technology Intensity of U.S. Output and Trade.

APPENDIX C

LIST OF RELATED PUBLICATIONS

Davis, Lester A. Domestic Employment Generated by U.S. Exports (Staff report). Washington, D.C.: Office of Trade and Investment Analysis, International Trade Administration, U.S. Department of Commerce, May 1983.

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☆U.S. Government Printing Office: 1986—491-070/40085